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ALADIN LASER TRANSMITTER TEST RESULTS IN THE FRAME OF AEOLUS MISSION END OF LIFE ACTIVITIES

Abstract

In 2018 the Aeolus missions has been started with the aim to perform wind measurement using a doppler lidar instrument (ALADIN). After almost five-year mission and before the first assisted re-entry in the history, it was decided to perform many tests in flight that could not be performed during the operative mission: the so called End of Life Activities.

Tests were performed after more than 53 months of operation in flight at platform, instrument and laser levels. The instrument was equipped with two lasers: laser A was operated for about 14 months (equivalent to 1.9 GShots) while laser B was operated 39 months (5.2 Gshots), covering the initially planned mission lifetime of 3.3 years. During the operational period, the energy loss of the laser B was only 22 percent, in line with lifetime degradation expectations (degradation of semiconductor laser diodes).

The tests on the laser have been performed on the laser B and concerned the improvement of the frequency stability and the increase of the UV energy by steps using different parameters. The tests demonstrated the improvement of the frequency stability by a factor 2 and the Aladin laser achieved a record emitting 182mJ of UV energy in space for 33 hours.

The Aladin transmitter demonstrated that all the used technologies are reliable: optical coatings, harmonic crystals, laser diodes, optical amplifiers maintain almost constant their performances and are fundamental elements for lasers in next missions as EarthCare.

The launch of this mission is foreseen in May 2024 and includes a new Atmospheric Lidar (ATLID) on board. The Atlid transmitter was developed by Leonardo and its laser architecture is similar to the Aladin one. Basing on Aladin experience, efforts have been put in the Atlid design in order to improve thermo-mechanical stability and robustness against contamination induced LIDT, including dry air pressurization. In the transmitter a beam steering mechanism (developed by Sodern) is included which, commanded at instrument level, allows the compensation of possible misalignment between the TxA and the receiver assembly which are mounted on a common assembly but have independent optical paths. Enhanced performance stability has been proven during on ground test at laser and instrument level. The first in-flight results are expected to be made available at the conference.